

# REPRODUCTION

# LEARNING OUTCOMES

*Students will be able to:*

1. define reproduction and describe its importance;
2. differentiate between asexual and sexual reproduction;
3. describe different types of asexual reproduction i.e. binary fission, budding, spore formation and vegetative propagation.

# Reproduction

**Reproduction** is the biological process by which new "offspring" individual organisms are produced from their "parents".

Reproduction is a fundamental feature of all known life; each individual organism exists as the result of reproduction.

The known methods of reproduction are broadly grouped into two main types: sexually and asexually.

# Importance

1. To create next generation. The characteristics of organisms are transferred from one generation to the next generation through genes, which are situated in the DNA (deoxyribonucleic acid).

2. During meiosis number of chromosomes become half of that in the parent cells. As a result when both male and female gametes fuse to form zygote, the number of chromosomes becomes adequate for the species involved.

3. Every animal cell has fixed number of chromosomes. A human cell contains 23 pairs or 46 chromosomes. After meiosis egg and sperm cells contain 23 chromosomes. After zygote formation the number of chromosomes is once again upto 23 pairs. This is necessary to maintain the unique identity of a species.

4. To create variations in species. As no two individuals are same, so genetic characters from both parents will help make a slightly different copy of themselves. These small variations accumulate over hundreds of years resulting in formation of new species.

5. New species facilitate evolution of organisms. Evolution is necessary for survival as environmental conditions keep on changing from time to time.



# Asexual Reproduction

**Asexual reproduction** is a mode of reproduction by which offspring arise from a single parent, and inherit the genes of that parent only. As a result, the offspring are identical to the parent.

# Sexual Reproduction

**Sexual reproduction** is the creation of a new organism by combining the genetic material of two organisms.

The two main processes are: meiosis, which involves reduction in the number of chromosomes; and fertilization, involving the fusion of two gametes and the restoration of the original number of chromosomes.

During meiosis, the chromosomes of each pair usually cross over to achieve homologous recombination.

# Types of Asexual Reproduction

## Binary Fission

Binary fission involves mitosis only and hence the resultant individuals are genetically identical to each other and to the parent. It is the simplest and the most common method of asexual reproduction. The whole parental body acts as the reproductive unit. The nucleus of the unicellular parent organism divides into two. This is followed by the division of the cytoplasm and two daughter cells of almost equal size are formed. The daughter cells grow in size and then divide again. Examples: Seen in euglena, amoeba, paramaecium.



## Budding

Here one or more outgrowths of reproductive units called buds are formed on the parental body. Each bud consists of a small group of cells surrounded by the epithelium. A bud develops as a small outgrowth on the parents body. Each bud enlarges, develops the characteristics of the parent organism. A bud may become separated from the parent body and then develop into a new individual, or it may separate only after the completion of development. In some cases the buds never separate and as a result, colonies of interconnected individuals are formed.

Examples: Hydra, sponges, some tunicates.

## Spore formation

Many multicellular organisms form spores during their biological life cycle in a process called ***sporogenesis***. Plants and many algae undergo *sporic meiosis* where meiosis leads to the formation of haploid spores rather than gametes. These spores grow into multicellular individuals (called gametophytes in the case of plants) without a fertilization event. These haploid individuals give rise to gametes through mitosis. Meiosis and gamete formation therefore occur in separate generations or "phases" of the life cycle, referred to as alternation of generations.

Since sexual reproduction is often more narrowly defined as the fusion of gametes (fertilization), spore formation in plant sporophytes and algae might be considered a form of asexual reproduction (agamogenesis) despite being the result of meiosis. However, both events (spore formation and fertilization) are necessary to complete sexual reproduction in the plant life cycle.



## **Vegetative propagation**

Vegetative reproduction (vegetative propagation, vegetative multiplication, vegetative cloning) is a form of asexual reproduction in plants. It is a process by which new individuals arise without production of seeds or spores.

Although most plants normally reproduce sexually, many have the ability for vegetative propagation, or can be vegetatively propagated if small pieces are subjected to chemical (hormonal) treatments.

This is because meristematic cells that are capable of differentiating are present in many plant tissues.

Vegetative propagation is a form of asexual reproduction where only one plant is involved and the offspring is the result of one parent. The new plant is genetically identical to the parent.



# Multiple Choice Questions

1. The type of reproduction where there is involvement of both parents is

- A. budding.
- B. binary fission.
- C. spore formation.
- D. fertilization.

2. The type of reproduction where there are outgrowths of reproductive units is called

- A. budding.
- B. meiosis.
- C. binary fission.
- D. formation of spores.